



Office of the Director of
**Telecommunications
Regulation**

CONDITIONS

**for the Operation of
Cable Television Systems**

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**TECHNICAL CONDITIONS RELATING TO THE ESTABLISHMENT AND
OPERATION OF A WIRED BROADCAST RELAY SYSTEM
IN THE
FREQUENCY BAND 30.0 - 862.0 MHz**

1 PURPOSE

This document specifies the general conditions attached to a licence for wired broadcast relay systems in accordance with section 6(2) of S.I. 67 of 1974, Wireless Telegraphy (Wired Broadcast Relay Licence) Regulations, 1974.

2 SUMMARY INFORMATION.

These conditions detail those characteristics of the system that need to be considered for the purposes of providing a satisfactory service to the subscriber.

These conditions detail those characteristics relevant for ensuring compatibility with authorized users of the radio frequency spectrum.

The parameters specified in this document are mainly based on those given in CENELEC document EN 50083 parts 1, 2, 3, 5, 7 and 8 entitled "Cable Distribution Systems for Television and Sound Signals". The parameters only relate to analogue transmissions.

For issues not referred to by this document the licensee shall comply with standards set out in the CENELEC document EN 50083 parts 1 to 8.

Evidence of type approval of cable relay equipment is not required by the Director of Telecommunications Regulation. Instead a procedure of system audits will apply.

The conditions specified in this document may be revised and/or added to from time to time in accordance with section 6 (2) of S.I. 67 of 1974

Nothing contained in these conditions shall absolve the licensee from any requirement in law to obtain whatever additional consents, permissions, authorizations or licences that may be necessary for the exercise entitlements under the licence.

3 DEFINITIONS AND GLOSSARY OF TERMS

- 3.1 Cable relay systems
Those systems licensed under S.I. No. 67 of 1974 - Wireless Telegraphy (Wired Broadcast Relay Licence) Regulations, 1974.
- 3.2 Headend
Equipment which is connected to receiving antennas or other signal sources and also connected to the remainder of the cable relay system, to process the signal to be relayed.
- 3.3 Feeder
A transmission path forming part of a cable relay system. Such a path may consist of a metallic cable, optic fibre or any combination of them.
- 3.4 Trunk feeder
A feeder used for the transmission of signals between a head end and a distribution point or between distribution points.
- 3.5 Distribution point
A point where signals are taken from the trunk feeder to energize spur feeders
Note:- In some cases a distribution point may be directly connected to the head end.
- 3.6 Spur Feeder
A feeder to which subscriber taps are connected.
- 3.7 Subscriber's tap
A device for connecting a subscriber's feeder to a spur feeder.
- 3.8 Subscriber feeder
A feeder connecting a Subscriber's tap to a system outlet or, where the latter is not used, directly to the subscriber's equipment.
- 3.9 System Outlet
A device for connecting a subscriber's feeder to a receiver lead.

- 3.10 Service point
The expression used in S.I. 67 of 1974 to refer to a system outlet.
- 3.11 Receiver lead
A lead which connects the system outlet to the subscriber's equipment.
- 3.12 Subscriber's Equipment
Equipment at the subscriber's premises such as receivers, tuners, decoders, video recorders.
- 3.13 Transfer point
An interface between the cable relay system and the building's internal network, each of which may be separately owned.
- 3.14 Immunity (to a disturbance)
The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.
- 3.15 Screening effectiveness
The ability of equipment or a system to attenuate the influence of electromagnetic fields from outside the equipment or system or to suppress the leakage of electromagnetic fields from inside the equipment or system.
- 3.16 Intermodulation
The process whereby non-linearity in equipment in a system produces spurious output signal (called Intermodulation products) at frequencies which are a linear combination of those of the input signals.
- 3.17 Carrier to Intermodulation ratio
The difference in decibels between the carrier level at a specified point in a system and the level of a specified Intermodulation product or combination of products.
- 3.18 Carrier to Noise ratio
The difference in decibels between the vision or sound carrier level at a given point in the system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use).
- 3.19 Mutual Isolation
The attenuation between one system outlet and another at any frequency within the range of the system under investigation. It is always specified, for any particular installation, as the minimum value obtained within specified frequency limits.

- 3.20 Echo rating
The result of a system test with a 2 T sine-squared pulse (as determined in CCIR Recommendations 473 and 567) using the boundary line on a specified graticule within which all parts of the received pulse fall.
- 3.21 In-band channels
Channels used on a cable system whose frequencies are within one of the bands for broadcasting specified in the Irish Table of Frequency Allocations.¹
- 3.22 Out of band channels
Channels used on a cable relay system whose frequencies are not fully within one of the bands for broadcasting specified in the Irish Table of Frequency Allocations.
- 3.23 'Must carry' programme channels
These are television and FM sound radio programme channels which the licensee is obliged by the terms of his license to distribute on the cable relay system.
- 3.24 'Basic service' programme channels
These are television programmes and FM sound radio programme channels relayed by the licensee which a person is obliged to pay for in order to become a subscriber to a relay service.

¹ The bands -within the frequency range 30 MHz to 862 MHz- for broadcasting specified in the Irish table of Allocations are Band I (47 to 68 MHz), Band II (87.5 to 108 MHz), Band III (174 to 230 MHz) and Bands IV&V (470 to 862 MHz).

4. **System Transparency**

4.1 **Television**

Unless specifically excluded by the licence the cable relay system shall be designed in such a manner that it is capable of relaying all components within a television signal, intended for general reception^{2 3}.

Note:- This would include:-

Teletext and additional sound channels associated with the vision material. (see section 6.1.3)

This provision does not relate to:-

- additional sound channels associated with satellite Television transmissions carrying material not associated with the vision material.
- additional sound channels -in different languages- associated with satellite Television transmissions carrying material associated with the vision material.

4.2 **FM Sound Radio**

Unless specifically excluded by the licence the cable relay system shall be designed in such a manner that it is capable of relaying all components transmitted within a sound broadcast signal and intended for general reception⁴.

Note:- This would include radio data systems (RDS) and other permitted sub carriers for the transmission of supplementary information. (see Section 6.2.2).

²While not intended for reception by the general public, broadcast organisation include Test insertion signal in the vertical blanking interval (VBI). The system must be transparent to these signal so as to facilitate performance measurements.

³ While the cable relay system shall be designed to relay all the components within a television signal the actual components relayed shall take account of the copyright arrangements between the licensee and the service provider.

⁴ While the cable relay system shall be designed to relay all the components within a FM sound radio signal the actual components relayed shall take account of the copyright arrangements between the licensee and the service provider

5. System Engineering

5.1 General

The mechanical and electrical construction of the cable relay system shall accord with best practice.

The practice of good system engineering is a necessary requirement to ensure the provision of a high quality service and the minimizing of the potential for interference to, or from, radiocommunication services operating in accordance with the Irish Table of Frequency Allocations. This is particularly relevant when considering:

- leakage from the cable relay system which could interfere with radiocommunication services, especially aeronautical systems, private mobile radio networks used by the emergency services, stations of the amateur service and other radiocommunication stations operating in the same environment as the cable relay system.
- the ability of the cable relay system to perform without degradation in the same environment as radiocommunication services operating in accordance with the Irish Table of Frequency Allocations.

5.2 Headend installation

As the performance of the headend installation is critical to the overall performance of a cable relay system care must be taken in the installation and maintenance of this equipment. The headend and associated equipment shall be labeled with the manufacturer's trade mark, type designation and function. The label shall be fitted on the outside of the equipment, and shall be clearly readable.

All controls, meters, indicators and terminals shall be clearly labeled. Controls which, when wrongly adjusted, increase the risk of causing interference or of improper functioning of the system shall be immediately accessible to qualified personnel only.

5.2.1 Spurious Emissions and Receiver Filtering

Careful consideration should be given to the levels of unwanted emissions received at the headend and adequate filtering employed to ensure that the picture and sound quality as specified in Section 7 for each system outlet can be met.

5.2.2 Headend output

The signal parameters at the headend output should be such as to permit the cable relay system to operate in accordance with the system standard and performance set out in Sections 6 and 7 respectively.

5.3 Standards for installation by non-licensee staff.

The licensee shall provide written guidelines on installation standards to individuals or organizations or their representatives, authorized by the licensee, for the installation of additional wiring after the system outlet or transfer point of the cable relay system within their premises so as to ensure that the leakage and immunity requirements in Section 9 are met.

5.4 Weather Protection.

All apparatus and cables exposed to weather, corrosive atmosphere or other adverse conditions shall be so constructed or protected as may be necessary to prevent danger arising from such exposure.

5.5 Use of Earth.

The use of an earth return circuit for programme transmission is prohibited. This does not preclude the earthing of the sheath of a cable.

6. System Standards

6.1. Television Standard

The television standard used shall be PAL system I.

6.1.1 Summary list of parameters:-

6.1.1.1 Frequency spacing

Nominal radio-frequency channel bandwidth	8 MHz
Vision/Sound Carrier separation	5.9996 MHz (±0.0005 MHz)
Nearest edge of channel relative to vision carrier	-1.25 MHz (see note 1)
Nominal width of vestigial sideband	1.25 MHz
Nominal width of main sideband	5.5 MHz

Note 1:- Where NICAM sound is used on the lower adjacent channel and a “harmonically related carrier” arrangement is used for the carrier frequencies, this figure may have to be reduced to -0.75 MHz.

6.1.1.2 Modulation

Type and polarity of vision modulation	C9F neg.
Type of sound modulation	F3E
- Maximum frequency deviation	±50 kHz
- Pre-Emphasis for modulation	50 µS

6.1.1.3 Levels in the distributed signal (% of peak vision carrier)

Synchronizing level	100
Blanking level	76 ±2
Difference between black level and blanking level	0 (nominal)
Peak white level	20 ±2
Ratio of vision to sound carrier powers ¹	between 10 dB and 13 dB

⁵ In certain cases an alternative vision to sound carrier ratio may be specified by the Director of Telecommunications Regulation.

6.1.2. Permitted second sound carrier for the transmission of stereo or bilingual sound.

An additional carrier at 6.552 MHz above the vision carrier for the NICAM 728 multi channel sound system as specified in ITU-R Rec. 707 is permitted.

6.1.3 Additional Broadcasting Services

6.1.3.1 Permitted Additional Broadcasting Services.

The transmission of a teletext service during the field blanking interval is permitted. The system used must conform to Teletext System B parameters described in ITU-R Rec. 653-1. Insertion reference signals may be transmitted on lines 17 and 330 as outlined in ITU-R Rep. 628-4. Insertion test signals for automatic monitoring of the television system may also be transmitted on other blank lines.

6.1.3.2 Additional Broadcasting Services Requiring Approval from the Director of Telecommunications Regulation

Prior approval must be obtained from the Director of Telecommunications Regulation for any additional services other than those indicated in Section 6.1.3.1 that are included within a television channel.

6.2 FM Sound Radio

6.2.1 Modulation Standards

The transmission system used shall be either Monophonic or Stereophonic pilot tone system as specified in ITU-R Rec. 450-1 The main parameters for these systems are:-

6.2.1.1 Monophonic Transmission

The radio-frequency signal consists of a carrier, frequency modulated by the sound signal, after pre-emphasis, with a maximum frequency deviation of ± 75 kHz.

6.2.1.2 Stereophonic Transmission

The radio-frequency signal consists of a carrier, frequency modulated by a baseband signal according to the specifications of the pilot-tone system. The maximum frequency deviation is ± 75 kHz.

6.2.1.3 Pre emphasis and low pass filter

The headend must be provided with a pre-emphasis filter with a time-constant of 50 microseconds, combined with a low-pass filter with an attenuation of at least 30 dB at an input modulation frequency of 20 kHz, relative to the level at 1 kHz.

6.2.2 Permitted sub carriers for the transmission of supplementary information.

The addition of a sub-carrier on 57 kHz for the transmission of supplementary information using the Radio Data System (RDS), as specified in Irish Standard/EN 50067 : 1993 ¹, is permitted. Only certain features of this system are licensed¹ to Irish broadcast stations.

6.3 Leakage reference signals

Any cable relay system is likely to be spread over a wide area and its quality as regards screening effectiveness may vary from part to part. To obtain a complete picture of leakage characteristics measurements have to be made over its entire area and on a regular basis. This also helps to locate all the strong leakage points caused by major faults in screening effectiveness.

In order that the measurements are not confused by off-air signals, a leakage reference signal, also referred to as a “tagged carrier”, which can positively identified as emanating from the cable relay system must be used.

The modulation, frequency and level at which the leakage reference signal shall be specified by the Director of Telecommunications Regulation following consultation with the licensee. As there will be ongoing developments in the use of the Radio spectrum, it may be necessary to change the frequency used from time to time.

⁶Available from the National Standards Authority of Ireland

⁷An updated list of approved features shall be provided to the licensee by the Director of Telecommunications Regulation on request.

7 System Performance

7.1 General

7.1.1 Impairment quality

This section defines the system performance limits which will, with an unimpaired input, produce picture and sound signal where the impairment to any single parameter will be no worse in normal operating conditions for any channel than grade four on the five grade impairment scale contained in CCIR recommendation 500-5 (1992 - CCIR recommendations RBT series broadcasting service (television)) as given below:

Five-grade-scale			
Quality (of picture)		Impairment (due to interference)	
5	Excellent	=	Imperceptible
4	Good	=	Perceptible but not annoying
3	Fair	=	Slightly annoying
2	Poor	=	Annoying
1	Bad	=	Very annoying

The performance limits set out in this section apply in the presence of all signals for which the cable system was designed.

7.1.2 Impedance

The nominal impedance of the system shall be 75 ohms. It should be noted that this value applies to all coaxial feeder cable and system outlets and shall be used as the reference impedance in level measurements on the cable relay system.

7.1.3 Measurement point

The parameters specified in Section 7 relate to performance at the system outlet. However it is recognized that subscribers often install system outlets additional to those installed by the licensee. Where additional outlets occur after the system outlet installed by the licensee the values specified in Section 7 shall relate to the licensee's system outlet.

Where a licensee installs a transfer point then the licensee must install a system outlet and this will be the reference outlet for measurement purposes. The signal provided to the transfer point should be above the minimum specified so that measurements at the reference outlet will be in accordance with those specified in Section 7.

7.1.4 Markings on system outlet

Where both television and FM sound radio services are provided a separate outlet connection shall be provided for each service. Outlet connections should be clearly labeled indicating whether they are for FM Sound radio or for television.

7.2 System performance for Television.

7.2.1 Carrier levels at system outlets.

7.2.1.1 Minimum and maximum carrier levels

The minimum and maximum carrier levels are expressed as the r.m.s. voltage of each vision carrier at the peak of the modulation envelope measured at the system television outlet across an external 75 ohm termination or referred to 75 ohms. These values are given in table 1.

Table 1 Minimum and maximum carrier levels at system outlets.

Type of Service	Minimum carrier level (dBuV)	Maximum Carrier level (dBuV)	Conditions
AM VSB Television (PAL System I)	57	80 77**	** for systems over 20 channels

Note :- In order not to overload the receivers, the figures quoted above for the maximum level might have to be reduced.

7.2.1.2 Maximum Carrier level differences between relayed television channels

The difference in carrier levels shall not exceed the values given in table 2. It should be noted that the differences given in table 2 apply to signals having the same type of modulation.

Table 2 Maximum Carrier level differences at system outlets between distributed television channels.

Frequency Range	Maximum level difference (dB)
30.0 MHz to 862 .0 MHz	12
Any 60.0 MHz range	6
Adjacent channel	3

7.2.2 Mutual isolation between system outlets

The minimum isolation at any frequency between any two subscriber system outlets connected separately to a spur feeder of the cable relay system shall be as in table 3.

Table 3 Mutual isolation between system outlets.

Frequency Range in MHz.	Mutual Isolation (dB)	Condition
TV/TV 30.0 to 862.0	42 36*	* For systems having 8 and 12 MHz spacing

7.2.3 Amplitude response within a television channel at any system outlet.

The Amplitude response as a function of frequency for the entire system shall be such that the variation in gain over any A.M. television channel of 8 MHz bandwidth is not more than ± 2 dB relative to that at the vision carrier frequency and the gain shall not vary by more than ± 0.5 dB within any frequency range of 0.5 MHz.

7.2.4 Frequency stability of relayed carrier signals at any system outlet.

When a signal is not relayed at the received frequency or is locally generated, the variation in frequency from the declared nominal value shall not exceed ± 30 kHz for a television signal and the difference between vision and sound carriers for any one channel shall be maintained within ± 15 kHz.

7.2.5 Random Noise

At any system outlet, the level of noise voltage generated in the system in any channel shall be such that the carrier to noise ratio shall not be less than the value given in table 4.

Table 4. Carrier to noise ratio at system outlet

Type of service	Minimum carrier to noise ratio (dB)	Equivalent noise bandwidth (MHz)
AM VSB Television (PAL System I)	44	5.08

7.2.6 Interference to Television channels

7.2.6.1 Single frequency interference

This clause refers to single-frequency interference which may result from intermodulation or the presence of other interfering signals (local oscillators, ingress signals etc.)

At any system outlet the level of any unwanted signal generated within the system shall be such that the lowest carrier to interference ratio within a wanted television channel shall not be less than 57dB.

7.2.6.2 Single channel Intermodulation interference

In this special case of single frequency interference the ratio of the reference level relative to the interference signal shall be not less than 54 dB.

7.2.6.3 Multiple frequency Intermodulation interference

At any system outlet the level of multiple frequency Intermodulation interference in any wanted television channel shall be such that the carrier to interference ratio shall not be less than

57dB for each cluster of composite beats in negative modulation;

52 dB for each cluster of composite beats in positive modulation;

52 dB for the summation of the clusters falling into that channel.

Note:- Where “Harmonically related carriers” are used a relaxation of 10dB can be considered.

7.2.7 Differential gain and phase in a television channel

The differential gain and phase in any television channel at any system outlet shall not exceed the figures given in table 5.

Table 5 Differential gain and phase in a television channel.

Type of service	Maximum differential gain (%)	Maximum differential phase (degrees)
AM VSB Television (PAL System I)	14	12

7.2.8 Echoes in television channels

The echo rating in any television channel at any system outlet shall not exceed 6%

7.2.9 Hum modulation of carriers in television channels

At any system outlet the spurious modulation of any vision carrier at the frequency of the supply mains and harmonics thereof shall be such that the reference modulation to the hum modulation ratio is not less than 46 dB.

7.3 System performance for FM Sound Radio

7.3.1 Carrier levels at system outlets.

7.3.1.1 Minimum and maximum carrier levels

The minimum and maximum carrier levels are expressed as the r.m.s voltage of each carrier measured at the system outlet connection for FM sound radio across an external 75 ohm termination or referred to 75 ohms. Values are given in table 6.

Table 6 Minimum and maximum carrier levels at system outlets.

Type of Service	Minimum carrier level (dBuV)	Maximum Carrier level (dBuV)
FM sound mono	40	70
Stereo	50	70

NOTE:- In order not to overload certain receivers, the figures quoted above for the maximum levels may have to be reduced.

7.3.1.2 Carrier level differences

FM sound radio signals shall be at the same level at the headend before transmission through the cable relay system. The difference in FM sound radio carrier levels at the system outlet shall not exceed the values given in table 7.

Table 7. Maximum level difference at any system outlet.

Frequency Range	Maximum level difference (dB)
87.5 to 107.9 MHz	6

NOTE:- If FM. sound signals are present at the system outlet intended for AM-VSB television signals, the level of any FM. carrier shall be at least 3 dB lower than the lowest television signal at the outlet.

7.3.2 Mutual isolation between system outlets

The minimum isolation at any frequency between any two subscribers' system outlets connected separately to a spur feeder of the relay system shall be as in table 8.

Table 8 Mutual isolation.

Frequency Range in MHz.	Minimum Mutual Isolation (dB)
FM sound radio / FM sound radio	42

7.3.3 Amplitude Response within an FM sound radio channel

The Amplitude response as a function of frequency for the entire system shall be such that the maximum amplitude variation over any FM channel of 270 kHz is not more than 3dB with the slope not exceeding 0.3 dB per 10 kHz within 75kHz of the carrier

7.3.4 Frequency stability of relayed carrier signals at any system outlet.

When a signal is not relayed at the received frequency or is locally generated, the variation in frequency from the declared nominal value shall not exceed ± 12 kHz for an FM sound radio signal.

7.3.5 Adjacent channel spacing.

When individual channel processing is applied the minimum spacing between unmodulated carriers shall be not less than 300 kHz. The increment of channel spacing shall be an integer multiple of 100 kHz.

7.3.6 Interference

At any system outlet the level of any unwanted signal within the system shall be such that the lowest carrier to interference ratio between a wanted and unwanted FM sound radio signal is as shown in table 9.

Table 9. Minimum Carrier to Interference Ratio between wanted and unwanted FM sound signals

Type of Service	Minimum Carrier to interference Ratio (dB)
FM Sound Radio (mono)	36
FM Sound Radio (stereo)	51

7.3.7 Random Noise

At any system outlet, the level of noise voltage generated in the system in any channel shall be such that the carrier to noise ratio shall be no less than the value given in table 10.

Table 10. Carrier to noise ratio at system outlet

Type of service	Minimum carrier to noise ratio (dB)	Equivalent noise bandwidth (MHz)
FM sound mono	38	0.2
FM sound stereo	48	0.2

7.3.8 Hum modulation

Hum modulation sidebands must be at least 46 dB below the carrier level.

8. Encryption

8.1 General

Unless otherwise specifically authorized by the terms of the licence, “basic service” programme channels shall not be subject to encryption.

8.2 Coding Methods

The licensee shall be free to choose the type of encoding/decoding process to be used. However the encoding/decoding process shall not perceptibly degrade the quality of the signal provided at the output of the decoding device.

8.3 Output of the decoder

The output of the decoder must be within the normal VHF or UHF broadcasting bands and must be a standard PAL system I signal (see Section 6.1).

8.4 Transparency of the encoding / decoding equipment to multichannel sound system and permitted additional broadcast services.

Unless otherwise specifically authorized by the terms of the licence, where an encoding/decoding process is used the signal at the output of the decoder shall, if it was present in the received signal at the head-end, contain:

- a NICAM 728 multichannel sound system (see section 6.1.2)
- any additional broadcast services (see section 6.1.3.1) that were present in the received signal at the head-end.

(See also section 4 of this document)

8.5 Spectral Energy

The use of an encoding and decoding process shall not increase the spectral energy of the transmitted signal above that relevant to a standard 8 MHz PAL system I signal.

System outlet

8.6 Where encryption is used the output of the decoder is deemed to be the system outlet.

Note:- This condition shall only apply where the decoder is connected to a system outlet installed by the licensee or in accordance with the provisions of section 5.3.

9. Leakage and immunity

9.1 General

In general a cable relay system can covers a wide geographic area. The quality as regards screening effectiveness can vary from location to location. The licensee shall ensure that the cable relay system or any apparatus connected to it shall not cause interference to:-

- (a) reception of licenced sound broadcast programme services
- (b) reception of licenced television broadcast programme services
- (c) communication circuits of licensed telecommunication service providers
- (d) any wireless telegraphy stations authorized under the Wireless Telegraphy Acts (1926 - 1990).

The licensee shall be responsible for checking the level of signal leakage, on a regular basis, throughout the area served by the cable relay system and maintain them in accordance with the levels indicated in Table 11 (section 9.2).

Where signal leakage is detected and is deemed by the Director to be causing interference to any service contained in the categories listed in points 9.1 (a) to (d), the cable relay licensee shall take whatever steps are necessary to immediately eliminate the interference. If the licensee is unable to eliminate the interference the licensee shall remove the offending channel from the cable relay system until the matter is rectified to the satisfaction of the Director of Telecommunications Regulation.

In certain cases it may be necessary for the Director to specify lower limits for signal leakage or amend the licence to resolve any interference problems that arise.

9.2 Signal Leakage

9.2.1 The limits for leakage from a cable distribution system using analogue technology are given in table 11. The maximum⁸ field strength values are for a distance of 10 metres from the cable system.

Table 11 Signal Leakage Limits for Cable Distribution Networks

Frequency Range MHz	Maximum ⁸ Field Strength (dB μ V/m) at 10 m distance from the Cable system
30 - 44	Use prohibited
44 - 68	-2
68 - 74.8	-2
74.8 - 75.2	use restricted (note 2)
75.2 - 87.5	-2
87.5 - 108	8 (note 1)
108 - 138	use prohibited (note 3)
138 - 144	4
144 - 146	use prohibited
146 - 156.6	5
156.6 - 157.0	use restricted (note 2)
157.0 -174	5
174 - 230	13 (note 4)
230 - 242.8	9
242.8 - 243.2	use prohibited
243.2 - 281	10
281 - 282	use restricted (note 2)
282 - 318.5	10
318.5 - 319.5	use restricted (note 2)
319.5 - 328.6	11
328.6 - 335.4	use prohibited
335.4 - 380	11
380 - 405.85	11
405.85 - 406.25	use prohibited
406.25 - 430	12
430 - 440	use prohibited
440 - 450	12
450 - 470	12
470 - 790	13 (note 4)
790 - 862	13 (note 4)

Note 1: This values assumes 100 kHz separation from off-air FM broadcasting.

⁸ Notwithstanding the signal leakage limits set out in table 11 the licensee may be required to adhere to stricter limits in the event of interference being caused by the cable relay system to other authorised radio users. This is particularly relevant if interference is being caused to an aeronautical or emergency service. Any costs incurred shall be borne by the licensee.

- Note 2: The use of vision/sound/pilot carriers and colour subcarriers is prohibited in this range.
- Note 3: Except for the leakage reference signal, provided it is specifically authorized in the licence by the Director for Telecommunications Regulations.
- Note 4: The limit specified is based on the assumption that the cable system is not using a frequency channel that is co-channel with the frequency channels used for off-air reception within the cable area.

9.2.2 Correction factors that can be applied for various measurement distances are given in table 12.

Table 12. Distance correction factor

Distance (m)	Correction factor (dB)
3	+10
5	+6
10	0
15	-3.5
20	-6
25	-8
30	-9.5

Note: intermediate values of reduction factor should be obtained by interpolation.

9.3 Immunity

Interference can enter a cable relay system (sometimes referred to as ingress) by the following means:

- poor screening of passive equipment (plugs, etc.),
- poor screening of active equipment (amplifiers, converters etc.),
- poor screening of the cable against induced voltages,
- poor screening of the cable against induced currents,
- excessive impedance in the ground connection of the input terminals of active equipment
- insufficient rejection of power supply borne interference on mains powered equipment.

The licensee shall ensure that the immunity of the cable relay system shall be such that at any system outlet on any relayed channel the carrier to interference ratio (caused by an external field) shall be not less than the limit given for single frequency interference to television signals given in Section 7.2.6.1 and the values of carrier to interference ratios for FM sound radio signals given in Section 7.3.6.

10. Frequency Matters

10.1 Allocation of spectrum between 30.0 and 862.0 MHz.

The licensee shall only use the frequency channels authorized by licence for television and FM sound radio programmes on a cable relay system. Within this frequency range cover by this document (30 to 862 MHz) certain frequencies are not allowed to be used or are restricted in how they may be used. These frequency ranges are given in table 11 in Section 9.2.1.

10.2 Cable relay Frequency plan

10.2.1 Television

In assigning frequency channels to television programme services the licensee shall ensure that all programme channels which form part of the “basic service” shall be relayed on frequency channels which are within the standard broadcasting bands. Where the licensee has a difficulty with this provision, the procedures it is proposed to adopt, to overcome the problem encountered must be outline to the Director of Telecommunications Regulations for consideration.

In determining the “basic service” and assigning in-band channels to programmes, due consideration must be given to “must carry” programmes.

10.2.2 FM Sound Radio

In assigning FM sound radio programme channels to frequency channels the licensee shall comply with the following procedures:-

- All frequency channels used for the relay of FM sound radio programme channels shall be in the frequency range (87.5 to 108 MHz).
- The FM sound radio programme channels of Radio Telefís Éireann and of FM sound radio contractors of the Independent Radio and Television Commission shall not be relayed on the same frequency channels which are used to provide off-air service to the area served by the cable relay system.
- Channels on the cable relay system should avoid a 10.7 MHz separation from channels used for FM sound broadcasting in the same geographic area.

10.3 Priority between Radiocommunications Services and CATV Systems.

The licensee must, at their own expense, ensure that no interference is caused to licensed or otherwise authorized radio services as a result of the operation of the cable relay system and must act speedily and promptly to rectify such interference when it is brought to their attention. Where the Director of Telecommunications Regulation deems it necessary the licensee may be instructed to cease using the offending frequency channel(s) on their system.

11. Access to equipment, System testing and maintenance

11.1 Access and Personnel

The licensee shall on request made by an authorized officer of the Director of Telecommunications Regulation, facilitate that officer in the inspection⁹ of any part of the cable relay system.

11.2 Test equipment (system performance)

Adequate test equipment shall be held by the licensee for measurements of the system performance parameters specified in Section 7 whilst the system is undergoing initial alignment, regular maintenance and performance audits.

11.3 Test equipment (signal leakage)

Adequate test equipment shall be held by the licensee for measurements of the system signal leakage limits as specified in section 9.2 whilst the system is undergoing initial alignment, regular maintenance and performance audits.

11.4 Maintenance

The licensee shall ensure that the system is audited and maintained on a regular basis so as to ensure compliance with these conditions. The licensee shall keep a log indicating the dates and results of these audits and maintenance work undertaken. A copy of the maintenance programme and the log shall be made available to an authorized officer of the Director of Telecommunications Regulation on request.

⁹ Inspection shall include the undertaking of measurements
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12. Measurement procedures.

12.1 Measurement of performance parameters

Unless otherwise specified by the Director of Telecommunications Regulation, the procedure for measuring performance parameters shall be in accordance with those specified in CENELEC document EN50083 part 7.

Note:- As some of these procedure involve the removal of the programme signal and replacing it by a test signal, for the duration of the measurement period, alternative measurement procedures may be considered by the Director so as to minimize disruption to the viewers. However where the Director is not satisfied with results obtained using alternative measurement procedures then the measurements shall be repeated using the procedures in CENELEC document.

12.2 Measurement of signal leakage

Unless otherwise specified by the Director of Telecommunications Regulation, the measurement procedure for signal leakage reference signal shall be in accordance with the “mobile method” - section 4.2- in CENELEC document EN50083 part 8.

13. Performance Audits and information to be submitted to the Director of Telecommunications Regulation.

13.1 Regular performance Audits

Licensees will be required to undertake regular performance audits on their cable relay system and submit the results to the Director of Telecommunications Regulation for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Director of Telecommunications Regulation.

13.2 Regular Signal Leakage audits

Licensees will be required to carry out regular signal leakage audits on their cable system and submit the results to the Director of Telecommunications Regulation for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Director of Telecommunications Regulation.

13.3 Updating of information on subscribers

The licensee shall submit to the Director of Telecommunications Regulation on a six monthly basis an up to date list of:

- the number of subscribers using the cable relay system
- the number of system outlets in the cable relay system

13.4 Update of system information

The licensee shall upon request from the Director of Telecommunications Regulation, submit:-

- an up to date frequency plan indicating the programme name of each television channel and its vision carrier frequency. The licensee shall notify the Director immediately any change occurs.
- an up to date list of all the programme names of the FM sound radio channels and their respective carrier frequencies. The licensee shall notify the Director immediately any change occurs.
- an updated network diagram/map of their system clearly indicating the most up to date geographical area of operation of their cable distribution system and the location of the headend and feeder cables including amplifiers.

14. Channel Allocations

- 14.1 The channels authorised for use in the Wired Broadcast Relay system to which this licence relates are specified in the Schedule hereto.

15. Transitional arrangements.

- 15.1 Within 4 months of the introduction of these conditions, the licensee shall undertake a performance audit and a leakage audit of the cable relay system and shall submit the results to the Director for consideration together with a schedule for correcting any deficiencies identified in the audit. Any such schedule shall be subject to amendment and approval by the Director.